

**B.Tech. SEM -II (Chemical/ Civil/ Electrical/ Mechanical/  
Production/ Computer/ Info. Tech./ Electronics / Bio Medical / E  
& TC) 2014 Course (CBCS) : WINTER - 2017**  
**SUBJECT: FUNDAMENTALS OF MECHANICAL ENGINEERING**

Day: Wednesday  
Date: 22/11/2017

Time: 10.00 AM TO 01.00 PM  
Max. Marks: 60

**W-2017-2007**

**N.B:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Neat diagram must be drawn **WHEREVER** necessary.
- 5) Assume suitable data **WHEREVER** necessary.

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- Q.1 a)** Verify the first law of thermodynamics with the help of Joule's experiment. (05)
- b)** A steam turbine operates under steady-flow conditions. It receives 7200 kg/h of steam from boiler. The steam enters the turbine at enthalpy of 2800kJ/kg, a velocity of 4000 m/min and an elevation of 4m. The steam leaves the turbine at enthalpy of 2000 kJ/ kg, a velocity of 8000 m/min and an elevation of 1m. Due to radiation, heat loss from the turbine to the surrounding amount of 1580kJ/h. Calculate the output of the turbine. (05)

**OR**

- Q.1 a)** With an example define the following terms. (05)
- i) Quasi-Static Process      ii) Throttling Process
- b)** In a boiler, water enters with an enthalpy of 168 kJ/kg and steam leaves with enthalpy of 2925 kJ/kg. Find the heat transferred per kg of steam. The changes in kinetic and potential energies may be neglected. (05)
- Q.2 a)** With the help of schematic diagram explain working of two stroke diesel engine. (05)
- b)** Draw a vapor compression refrigeration system and name its various parts. (05)

**OR**

- Q.2 a)** With a neat sketch explain working of four stroke petrol engine. (05)
- b)** Explain with a block diagram working of closed cycle gas turbine. (05)
- Q.3 a)** Write a short on "Tidal Energy". (05)
- b)** Classify and explain type of heat exchanges based on relative direction of fluid motion. (05)

**OR**

- Q.3 a)** Explain in brief hydroelectric power plant. (05)
- b)** State Stefan-Boltzmann law. The effective temperature of a body having an area of 0.12m<sup>2</sup> is 527<sup>0</sup>C. Calculate the total rate of energy emission. (05)

**P.T.O.**

- Q.4 a)** State and explain Newton's Law of Viscosity. Also derive the equation for the same. (05)
- b)** A glass tube of 2.5 mm diameter is immersed in water. The surface tension  $\sigma=0.0725$  N/m for water. The contact angle  $\theta=0^\circ$  for water. Calculate capillary rise or fall. (05)

**OR**

- Q.4 a)** Define the following properties of fluid and explain their importance in fluid Mechanics. (05)
- i) Bulk Modulus of Elasticity and Compressibility
  - ii) Vapor Pressure
- b)** A droplet of water of 0.04 mm diameter  $d$  has an outside atmospheric pressure of  $103.2\text{KN/m}^2$ , Find the pressure inside the droplet, if the surface tension of water is  $0.0725\text{N/m}$ . (05)
- Q.5 a)** Explain with neat sketch working of Ratchet and Paul mechanism. Also state its applications. (05)
- b)** What is meant by Inversion? Explain working of four bar chain mechanism. (05)

**OR**

- Q.5 a)** Explain with neat sketch (05)
- i) Gib headed key
  - ii) Woodruff key
- b)** What is the need of clutch in automobiles? Explain in brief working of cone clutch. (05)
- Q.6 a)** Draw a block diagram of a CNC machine and explain its working. List advantages over conventional machines. (05)
- b)** Explain soldering and brazing process with applications. (05)

**OR**

- Q.6 a)** How do you differentiate between sheet metal forming and sheet metal cutting process? Also state application of each of these. (05)
- b)** Write a short note on casting and state its applications. (05)